Figure 1 shows the relative permeability with respect to brine saturation ($S_w$), for the $CO_2$-brine system during drainage and imbibition used for rock type I and II. krw and krg represent the relative permeability of brine and $CO_2$, respectively. No special core analysis (SCAL) data available in this pre-construction phase, therefore irreducible water saturation ($S_{wir}$) was assumed to be 0.2 and 0.3 for sand and shale, respectively. Note that irreducible gas saturation ($S_{gir}$) was set to zero, which led to the simulated results conservative in terms of $CO_2$ migration or plume-based AoR. SCAL with the rock cores in the Mendota storage site will be conducted from a proposed characterization well and used to define the relative permeability and capillary pressure to better estimate $CO_2$ plume behavior. End-point relative permeability (Krg) at irreducible water saturation for both rock types was assumed to be 1.0. van Genuchten model was used to create relative permeability and capillary pressure curve. Table 1 summarized the constitutive relationships for the reservoir rock types in the model. No hysteresis in the relative permeability and capillary is considered currently.

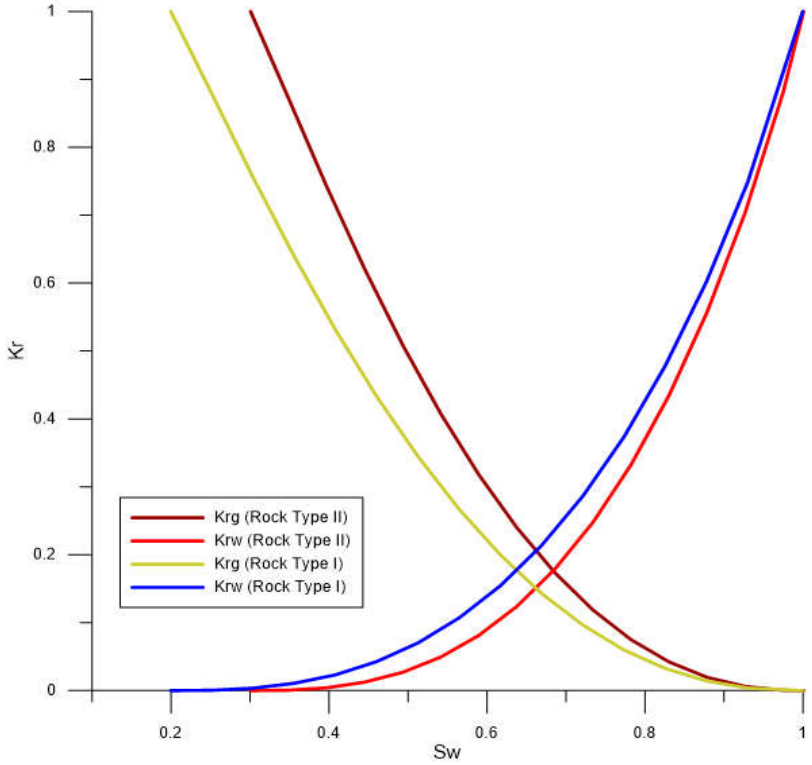


*Figure 1: Relative permeability curves for rock type I and II.*

*Table 1: Constitutive relationships for rock types used in reservoir modeling*

| Rock Type | | Rel. Perm | | Capillary Pressure ($P_c$) |
|---|---|---|---|---|
| | | CO2 | Brine | |
| I | Drainage | van Genuchten model<br>$S_e=(S_w-S_{w,ir})/(1-S_{w,ir})$<br>$K_{rg}=k_{rg}(S_{w,ir})\ (1-S_e)^{1/2}\ (1-S_e^{1/m})^{2m}$<br>m=0.92 | van Genuchten model<br>$S_e=(S_w-S_{w,ir})/(1-S_{w,ir})$<br>$K_{rw}=S_e^{1/2}[1-(1-S_e^{1/m})^m]^2$<br>m=0.92 | van Genuchten model<br>$S_e=(S_w-S_{w,ir})/(1-S_{w,ir})$<br>$P_c=\alpha^{-1}[(Se^{-1/m}-1]^{1/n}$<br>$\alpha$ (1/Pa)= 5.32E-5<br>m=0.92<br>n=1/(1-m) |
| | Imbibition (hysteresis) | No Hysteresis | No Hysteresis | No Hysteresis |
| II | Drainage | van Genuchten model<br>$S_e=(S_w-S_{w,ir})/(1-S_{w,ir})$<br>$K_{rg}=k_{rg}(S_{w,ir})\ (1-S_e)^{1/2}\ (1-S_e^{1/m})^{2m}$<br>m=0.92 | van Genuchten model<br>$S_e=(S_w-S_{w,ir})/(1-S_{w,ir})$<br>$K_{rw}=S_e^{1/2}[1-(1-S_e^{1/m})^m]^2$<br>m=0.92 | van Genuchten model<br>$P_c=\alpha^{-1}[(Se^{-1/m}-1]^{1/n}$<br>$\alpha$ (1/Pa)=1.19E-6<br>m=0.92<br>n=1/(1-m) |
| | Imbibition (hysteresis) | No Hysteresis | No Hysteresis | No Hysteresis |

where
$K_{rg}$ : CO2 relative permeability
$K_{rw}$ : aqueous relative permeability
$S_w$: water saturation
$S_{w,ir}$: irreducible water saturation
$S_e$: effective wetting fluid saturation
$S_{co2}$: CO2 saturation (=1-$S_w$)
$\alpha^{-1}$ : entry pressure (psi)
n and m: fitting parameters